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Plant to Implement Halt Index under 3 General Rules of Defense Armament Transfer: Development of New Index that Will Replace 1% Framework of GDP

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Abstract

In April, 2014, the cabinet reexamined the 3 general rules of arms export and they approved these 3 general rules of arms armament transfer. In addition, with the GDP calculation method being revised in December 2016, this amount is expected to increase further. The purpose of this study is to propose the framework of defense spending for the next phase, since as of current, Japan is no longer able to contain its defense spending within 1 % ratio to GDP.

This study is unique in a sense that this is the first ever research to analyze the economic model regarding the lifting of ban on Japanese arms export in 2014, that used Leontief's industry related analysis that was originally created to analyze disarmament. We would like to propose its halt index by analyzing the economic model.

As one method of effective implementation, we propose to set a new criterion of "shy away from setting both index of power of dispersion and index of sensitivity above 1", and strategize economic policy and defense policy under this premise.

Keywords: within 1% framework of the nominal GDP, halt index, input-output table, index of sensitivity, index of power of dispersion

1. Introduction

1.1 Purpose

In April, 2014, the cabinet reexamined the 3 general rules of arms export (The prohibition of the weapon export to the Communist bloc countries, the country prohibited by United Nation resolution, and the country concerned of the international dispute), and they approved these 3 general rules of arms armament transfer. Accordingly, under the new general rule, Japan is now able to export arms which, in turn, signifies the de facto lifting of a ban on arms export. According to the "World Military Expenditures and Arms Transfers 2015" (WMEAT) report of U.S. Department of State, between 2002 and 2012 (10-year period), Japan ranked No. 1 in the world as the nation with the largest amount of arms import (survey object: 170 countries). This finding also points to the fact that Japanese defense industry is still at the state of infancy. In terms of imports, Japan relied heavily on imports from the U.S, and for the rest of defense armaments, Japan managed to cover mostly on their own. In terms of Japanese defense industry's arms export, prior to 2014, it barely exported small-sized arms made for private sectors as its main exporting sectors.

When you exclude imports from the U.S., it is safe to say that Japanese defense market prior to 2014 was at the state of isolation. Such isolation exposed the problematic issue surrounding the domestic procurement of defense armament. It exposed the problem of Japanese defense industry selling arms at an inflated price and producing them at high costs, since virtually all of the arms were exclusively being sold to the Self-Defense Forces, added with the fact that decision-makers determined the sales price by padding a certain percentage on top of the expenses (note 1). Simply put, it was a kind of lax market dominated by a single buyer with no real price competition.

Amid such circumstances, the arms ban is expected to bring about growth in the Japanese defense industry. As advocated by Ando (2011), this move signifies the start of efficient economic activities in the defense industry. We expect the defense industry to grow tenfold under this market efficiency.

The purpose of this study is not to analyze the growth of defense industry. We will leave that up to our other studies. In addition to the lifting of the weapons export ban, the Japanese calculation method of GDP will be revised in December 2016 and its amount will become larger. The purpose of this study is to propose the framework of defense spending for the next phase, since as of current, Japan is no longer able to contain its defense spending within 1 % ratio to GDP. Due to the advancement of nuclear armament by North Korea etc., the military environment faced by Japan is becoming increasingly tougher. Because of this, depending on the size of GDP, it is possible that a record high 2017 defense budget may exceed the framework of 1% ratio to GDP. With ever expanding defense spending added with the lifted ban on arms export, these factors may push defense industry to expand vaguely thorough prioritization of profit. There is criticism among some people in Japanese society, saying this will only cause the industry to spiral out of control. However, if no one conducts an economic measurement that can serve as a brake, then discussions/debates will stall without any further progress, and such condition will further cloud the commitment toward putting on a brake. We would like to propose the halt index and its benchmark by analyzing the economic model. We are also creating this halt index for the sake of establishing a sound defense industry in Japan.

This study is unique in a sense that this is the first ever research to analyze the economic model regarding the lifting of ban on Japanese arms export in 2014, that used Leontief's industry related analysis that was originally created to analyze disarmament.

1.2 Preceding Study

Saal (2001) conducted an econometric analysis of the U.S. defense. He conducted economic analysis on relation between defense industry and other industries by measuring the entire productivity elements of the U.S. defense industry, and measured the effect its technical progress rate have on "productivity of other industries". In terms of study in Japan, we can refer to Ueno (2015) that discussed on the relation between defense industry and other industries.

Ueno discussed about the importance of industry related analysis on maritime cluster. It presented ambitious view point that actively tried to bring in industry related analysis for defense. Before anything else, it advocated the importance of conducting industry related analysis on Japanese defense.

Although an economic model analysis similar to Saal (2001) can be found here and there in overseas, in Japan, we cannot find any study that made empirical analysis of defense industry through the construction of economic model, let alone any study on the economic analysis of open arms expert. In the study of Mizuno et al. (2016), instead of analyzing the defense industry, they analyzed the utility of government's defense. They developed the measurement method of cardinal utility of government's defense, and they measured the size of its utilization by the successive cabinets. As the result, they were able to measure that government's utilization tends to score high during the term of prime minister with "hawkish" ideology. However, this study stopped short of analyzing private sector defense and effect of lifted ban on arms export.

Ando (2011) stated that economic efficiency can be achieved through an exchange of research developments between the defense industry and private sector. If we regard such study as the first half, then we can regard this study as the second half. Ando (2011) advocated that Japanese defense industry should become more open. Following Ando's study, in 2014, a ban was lifted on arms export and in effect created open defense industry. Thus, in this study, we will discuss about a type of moderation required to properly navigate through these changes from numerical perspective.

2. Current State of Japan

The FY 2015 defense budget was ¥4.9801 trillion and within the 1% framework of the nominal FY 2015 GDP of ¥500.5 trillion. The defense spending for FY 2016 was ¥5.541 trillion and was within the 1% framework of the nominal GDP of ¥511.5 trillion (July 2016 cabinet announcement of government outlook). By contrast, the government's FY 2017 defense spending demand is ¥5.16 trillion and considering the rather delicate situation, it remains to be seen whether the spending will fit the 1% of GDP ratio. However, since the defense spending of ¥211 billion was posted under the FY 2015 supplementary budget, the FY 2015 defense spending exceeded 1% of actual GDP with a cost of ¥5.1911 trillion (note 2).

When referring to domestic defense industry, some of the major manufactures are, amongst others, Mitsubishi Heavy Industries, Kawasaki and Mitsubishi Electric Corp. The total transaction amount between the entire defense industry and Ministry of Defense is published in the defense yearbook. Arthur (1991) asserted that Japanese defense industry in the 90's did not possess technological capability that can compete at global level. If this is the continued state, it means that these corporations and domestic industry cannot keep up with the increased amount of government's defense spending.

Although a less known fact, Japan has been exporting arms prior to 2014. It has been exporting hunting guns and ammunitions geared toward private sectors to countries like U.S., Belgium, and France, and in terms of its scale, it stands 9th in the world (The Graduate Institute of International Studies, Geneva) (note 3). Its data is shown in figure 1.

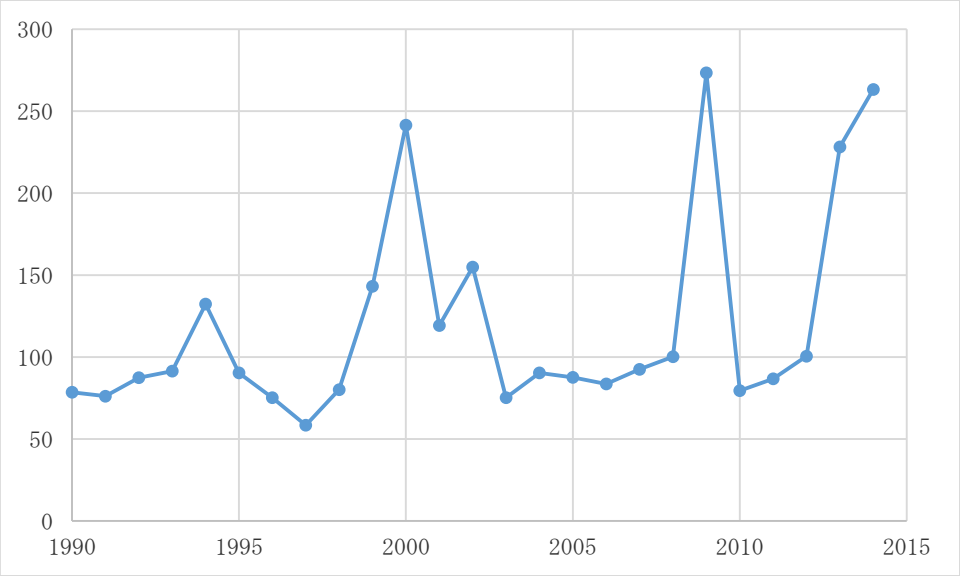

Figure 1. Export performance of Japanese small-sized arms Unit: U.S. $ 1 million (note 4)

Sakurabayashi (2010; p.162) stated that in times of peace, nations should hone technological development capabilities. Putting aside the issue of right and wrong, since Japan is not embroiled in the conflict of war in recent years, the nation is at an opportune state to further develop its defense industry. Due to the increased amount of arms export and its high demand, we can see the technological improvement in Japanese defense industry, when compared to the 90's as mentioned by Alexander (1991).

3. Input-Output Table

3.1 Creation of 4×4 Integrated Input-Output Tables

To make relation between defense industry and other industries more visible, we have created 4×4 integrated input-output table that includes defense division. (Note 5) Along with creating defense division, we integrated it with primary industry, secondary industry, and third industry.

Since a "defense" sector was originally not listed in the input-output table, we created a defense division in addition to "agricultural forestry industries and fishers," "manufacturing," and "others" (including mining, construction, and other unidentified categories).

Upon creating defense division, we first created 5×5 input-output table by separating "defense industry" from manufacturing division, and by separating "public defense division" from "others" division. "Public defense" refers to the defense related spending used by the Ministry of Defense in purchasing arms from manufacturing industry. Since these affairs are being processed under the sector "public duty", we separated the defense related spending portion from "others" division and called it "public defense". Accordingly, we integrated defense industry and public defense, and listed as 4×4 input-output table as shown in table 1.

This table 1 serves as input-output table that includes creation of defense division. Defense industry is not included in the manufacture division of table 1. Third industry, mining industry, construction industry and unidentified categories are included under "others" division, but "public defense" that was supposed to be included under "others" is not included. It is because the sector that integrated defense industry and public defense is listed under defense division shown in figure 1.

Table 1. Work Procedure 2 (creation of 4×4)

	Agricultural forestry industries and fishers	Manufacture industry	Defense	Others (mining industry, construction, and others)	Total final demand	Domestic production
Agricultural forestry industries and fishers	q_{11}	q_{12}	q_{13}	q_{14}	$q_{1,0}$	z_1
Manufacture industry	q_{21}	q_{22}	q_{23}	q_{24}	$q_{2,0}$	z_2
Defense industry (Manufacture industry)	q_{31}	q_{32}	q_{33}	q_{34}	$q_{3,0}$	z_3
Others	q_{41}	q_{42}	q_{43}	q_{44}	$q_{4,0}$	z_4
Added value	A_1	A_2	A_3	A_4		
Domestic production	z_1	z_2	z_3	z_4		

q_{11}, ..., q_{44}: intermediate demands

q_1, 0, ..., q_4, 0: final demands

z_1, ..., z_4: Domestic production

A_1, ..., A_4: Added value

3.2 2013 Input-Output Table

We actually created table 2 by using 2013 Japanese defense data and industry related extended table. The end result is the creation of 4×4 input-output table that included defense division.

Table 2. 2013 Input-Output Table (Title, Unit, ¥1 million)

	Agricultural forestry industries and fishers	Manufacture industry	Defense	Others	Total intermediate sectors	Total final demand	Domestic production
Agricultural forestry industries and fishers	1,483,025	7,962,695	0	1,501,408	10,947,128	1,204,900	12,152,028
Manufacture industry	2,900,787	139,419,561	1,116,714	72,963,350	216,400,412	70,714,210	287,114,622
Defense	0	982,817	2,030,932	4,737,350	7,751,099	-777,816	6,973,283
Others	1,951,561	56,886,815	1,122,877	173,297,636	233,258,889	400,949,634	634,208,523
Total intermediate sectors	6,335,373	205,251,888	4,270,523	252,499,744			
Total added gross value	5,816,655	81,862,734	2,702,760	381,708,779			
Domestic production	12,152,028	287,114,622	6,973,283	634,208,523			

Source of defense data: Bouei Nenkan Kankokai, Ed. (2016)

The breakdown of the −¥777816 million of the defense division's final demand is as follows: increase/decrease of inventory = −¥5299 million (actual value: 2013 industry-related extended table)/export of small-scale arms = ¥2.2274 million (actual value: United Nations)/import =− ¥796169 million (estimation: calculated using the same ratio as imports for manufacturing industry). We calculated the input coefficient from our input-output table. It refers to the input coefficient matrix of the 4 × 4 division. (note 6)

Table 3. 2013 Input Coefficient Matrix

0.1220	0.0277	0	0.0023
0.2387	0.4855	0.1601	0.1150
0	0.0034	0.2912	0.0074
0.1605	0.1981	0.1610	0.2732

Next, when we calculated the Leontief inverse matrix by using table 3, it came out as shown in table 4.

Table 4. 2013 Leontief Inverse Matrix

1.16	0.06838	0.01881	0.0148
0.6374	2.114	0.5554	0.3424
0.00763	0.01648	1.419	0.01721
0.4319	0.5951	0.4699	1.476

4. Simulation Analysis

4.1 Effect of Arms Export

By using the Leontief inverse matrix obtained in the above, we calculated the effect final demand (including defense division) have on other divisions. 2014 export performance of "military" arms (with lifted ban) was $475899 (note 7), which amounts to ¥50 million under yen conversion rate in 2014. We will calculate its effect on each division by using Leontief inverse matrix.

Table 5. Effect on Production of Arms Export (¥1 million) Actual Value in 2014

Agricultural forestry industries and fishers	0.9
Manufacture industry	27.8
Defense	71.0
Others	23.5

It brought the effect of ¥71 million to the defense, and when you add it vertically, it brings the total effect of ¥123．2 million. When you combine it with the export amount of final demand ¥50 million, it brought economic effect of ¥173.2 million to the Japanese economy.

4.2 Simulation

1) Simulation 1

The arms export amount of Korea in 2013 is $ 235 million (note 8), and if you convert it with the yen rate in 2013, it amounts to ¥22936 million. This amount is almost identical to Japan, since Japan already exported small-sized arms worth $ 22274 million in the same year.

However, now that ban has been lifted for arms export, what kind of economic effect will it have if Japan adds the arms export amount equal to the amount of Korea. We will calculate the effect on each division by using the Leontief inverse matrix by assuming the final demand of defense division as ¥22936 million.

Table 6. Effect on Production of Arms Export (¥1 million) Case of 2013

Agricultural forestry industries and fishers	431
Manufacturing industry	12739
Defense	32546
Others	10778

When combining it with the export amount of final demand of ¥22936 million, it has economic effect of ¥79430 million. It entails the same level of defense spending effect as Korea.

2) Simulation 2

Germany (3rd) and France (4th) in 2015 were $2049 million and $2013 million, respectively. What kind of effect will it have, if Japan becomes a superpower of defense industry and is able to compete neck and neck against these kinds of countries after the lifting of ban on arms exports?

Germany's $2049 million equals ¥247929 million, if you convert it with the yen rate in 2015.

Table 7. Effect on Production of Arms Export (¥1 million) Case of 2013

Agricultural forestry industries and fishers	4664
Manufacture industry	137700
Defense	351811
Others	116502

When combining it with the export amount of final demand of ¥247929 million, it has the economic effect of ¥858605 million. As you can see, the effect is significant when the defense spending is at the scale of Germany.

5. Index of Power of Dispersion and Index of Sensitivity

5.1 2013 Index of Power of Dispersion and Index of Sensitivity

We calculated the index of power of dispersion and the index of sensitivity by using table 3 input coefficient. (note 9).

Table 8. Index of Power of Dispersion

Agricultural forestry industries and fishers	0.9575
Manufacture industry	1.1959
Defense	1.0536
Others	0.792

Table 9. Index of Sensitivity

Agricultural forestry industries and fishers	0.5402
Manufacture industry	1.562
Defense	0.6251
Others	1.2725

Index of power of dispersion has an effect on national economy if it scores above 1, and no effect if it scores below 1. Defense does not have any effect on national economy or other industries. Index of sensitivity has an effect on national economy if it scores above 1, and no effect if it scores below 1. Defense industry is not affected by the national economy. Based on this interpretation, both coefficients scored below 1 for the Japanese defense industry, which means that the defense industry has a small influence of the national economy picture and the national economy has a small influence on defense industry at the same time.

5.2 "Guns and Butter" and Halt Index

When interpreting "guns and butter", the conventional wisdom interprets it as "guns or butter", a criterion of either prioritizing military spending or prioritizing public welfare. However, under today's situation where there are intimate connections between industries, there is a potential to interpret it as "guns and butter". In other words, it is saying that profits generated from guns production will spread across other industries and will eventually enable citizens to buy butter. In light of this, let us now separate this situation by using index of power of dispersion and index of sensitivity.

Case 1: When the index of power of dispersion and index of sensitivity are less than one, guns production will not lead to butter.

Case 2: When only the index of power of dispersion is greater than one, guns production will help citizens buy butter.

Case 3: When only the index of sensitivity is greater than one, citizens need to buy butter to produce guns.

Case 4: When the index of power of dispersion and index of sensitivity are both greater than one, there is a reciprocal interaction between guns and butter and both prosper if either is being sold.

As shown in the above, we were able to show the relation between military industry and national economy through the numerical value of index of power of dispersion and index of sensitivity. We believe these findings will serve as an important index regarding the lifting of ban on arms export. So far, Japanese defense industry has resulted in galapagosization due to years of unhealthy practice of having Defense Agency as its sole buyer. If Japanese defense industry is able to promote arms export in coming years and be included as part of the global economic mechanism and not just domestic economy, we believe these index values will undergo transformation. If we leave the condition as "index of power of dispersion and index of sensitivity are both below 1", even if the over excited defense industry are remonstrated, we can still minimize its effect on national economy. However, if it becomes "index of power of dispersion and index of sensitivity are both above 1", it will create a state in which it will cause a material effect on national economy just by adding a small restriction on defense industry.

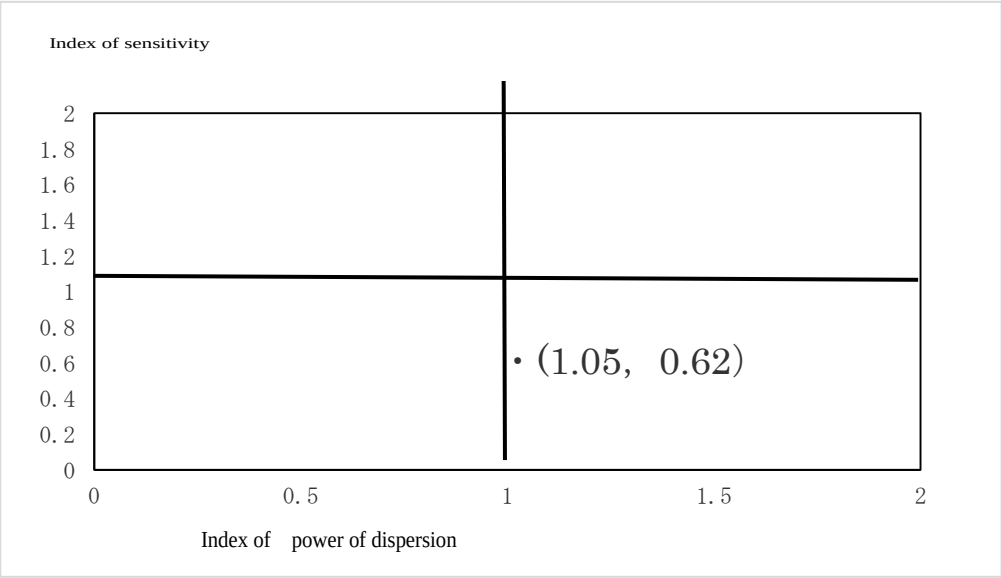

Figure 2. Index of Power of Dispersion and Index of Sensitivity

Chart 1 (It is a chart with (1,1) as the starting point. Currently, it is the point on the second quadrant)

Choosing the quadrant in which the numerical values in Table 10 should be placed is not only the government's but also the people's responsibility (in other words, deciding the placement of a halt standard between the quadrants). Our proposal is that, at present, it should be maintained in the range between the second and fourth quadrant. The benchmarks are as follows.

Case1: NG

Case2: OK

Case3: OK

Case4: OK

This is because the defense industry begins succeeding and integrating with the national economy and positioning itself on the first quadrant, which supports the Japanese economy, even though such a positioning will produce economic significance. This will also mean that the defense industry will spiral out of control.

However, a point as close as possible to the first quadrant is desirable because it positively influences the economy from an economic efficiency viewpoint. The coexistence of the halt and economic efficiency are also necessary.

Table 10. Halt Index of Arms Export

Third quadrant	Index of power of dispersion<1, Index of sensitivity <1	Isolation of defense industry
Fourth quadrant	Index of power of dispersion<1, Index of sensitivity>1	National economy is causing effect to defense economy
Second quadrant	Index of power of dispersion>1, Index of sensitivity<1	Defense economy is causing effect to national economy
First quadrant	Index of power of dispersion≧1, Index of sensitivity≧1	Defense industry and national economy are having significant effect on each other

6. Summary

In addition to the lifting of the ban on weapons export, the calculation method of GDP will be revised in this year and its amount is expected to become larger. It is highly likely that the benchmark of the 1% of GDP for expenditure in the defense budget will lose significance. For Japan to not have military power at the time of World War II, a new benchmark is necessary. It cannot set a new benchmark using a decimal system with 1%. Moreover, it is important to account for economic theory in the process. Thus, the defense industry is likely to be associated with economic growth.

In this study, we demonstrated a reasonable benchmark that could be supported by society and economic theory. For decades, predecessors have executed economic and defense policies under the premise of protecting the framework of 1%

of GDP (note 10). Given that the ban on arms export has been lifted, defense spending is likely to exceed the 1% of GDP depending on the size of GDP in the coming years. In light of this, as a method of effective implementation, we propose to set a new criterion, "shy away from setting both index of power of dispersion and index of sensitivity greater than one," and strategize economic and defense policies under this premise.

We calculated the index of power of dispersion and sensitivity for real defense using data for 2013. In the future, we will perform an analysis of the dynamics using time series data to measure whether the index of power of dispersion and sensitivity is less than the benchmark and how can the defense industry make a lower contribute to the Japanese economy than the benchmark.

Addendum

We used Actualitix statistics for military data.

・Statistics of Japan's export of small-scale arms is based on data by the United Nations:

http://ja.actualitix.com/country/jpn/ja-japan-arms-export.php

・Military arms:

http://ja.actualitix.com/country/jpn/ja-japan-military-arms-export.php

We used IMF data for the conversion rate of yen:

http://www.principalglobalindicators.org/?sk=388DFA60-1D26-4ADE-B505-A05A558D9A42

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Notes

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Note 1. Sakurabayashi (2013; p. 170) highlighted the issues surrounding defense purchase in Japan. Since there is no market price, a certain profit margin is posted on cost. Manufactures do not make the effort to reduce costs since this would means reduced profits; thus, buyers must purchase it at a higher price.

Note 2. "Supplementary budget is nothing more than extraordinary military spending account" (Toyo Keizai Online, Article by Kiyotani, S., January 26, 2015). http://toyokeizai.net/articles/-/58914T

Note 3. "Japan ranks higher as a small-scale arms export nation. Its global total trade amount has doubled in six years" (The Sankei Shimbun, August 28, 2012).

Note 4. Data for Japanese arms export are by the United Nations.

Note 5. For integration, we referenced Nakamura (2000; pp. 103-109) and Mizuno (2016).

Note 6. We referenced Nidaira (2008; pp. 34-43).

Note 7. This is based on United Nation data for Actualitix.

Note 8. Arms export data for Korea, Germany, and France are from World Bank data.

Note 9. Our calculation follows Fujikawa (2005; pp. 119-121).

Note 10. The method measuring Japanese GDP will be revised in December 2016.